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Publication

M-TRAC

for rail safety

FINAL ARGUMENT
DANGERS TO THE PUBLIC
PARTIALLY LOADED
CHEMICAL TANK CARS LABELLED EMPTY
MACMILLAN YARD EXPLOSION

PROV
TLX 98646

WT 16200 LB 77402 KG
LTWT 10960 LB 49631 KG
NEW 11 80

PUBLIC HEARING
RAILWAY TRANSPORT COMMITTEE
CANADIAN TRANSPORT COMMISSION
JUNE 1984

AXF 4289

M-TRAC

for rail safety

METRO TORONTO RESIDENTS' ACTION COMMITTEE

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FINAL ARGUMENT

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M-TRAC appeared as a party of record at the public hearing before the

CANADIAN TRANSPORT COMMISSION

RAILWAY TRANSPORT COMMITTEE

IN THE MATTER OF an occurrence on February 28, 1984, at the Canadian National Railways' MacMillan Yard in Toronto, Ontario, involving an empty tank car numbered UTLX 98646, which last contained liquefied petroleum gas (L.P.G.); and

IN THE MATTER OF Section 48 of the National Transportation Act, c. N-17, Revised Statutes of Canada 970.

File no. D.C. 15.7.13


M-TRAC, Metro Toronto Residents' Action Committee, is a non-profit Metro-wide umbrella organization of ratepayers, residents and other groups who, following Mississauga, joined forces to investigate and advocate rail safety in densely populated urban areas. Members are committed to initiate legislative and other changes necessary to ensure public safety, particularly in the transport of dangerous commodities by rail.

June 1984



"A long, fast train is a profitable one; it is not necessarily a safe one. I accept, of course, that in the course of natural justice one does not normally make an order affecting another's rights or pocket book without giving that other a chance to be heard. But there may come a time, where the safety of the citizen is concerned, when the onus shifts. In such case the burden of proof may (perhaps should) fall upon him who creates the risk."

--Mr. Justice Samuel G.M. Grange
Report of Mississauga Railway
Accident Inquiry 1980.



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"There has been a history of failure of this type of car which resulted in violent ruptures, and so forth, and the efforts of the people involved in the design of this equipment have been devoted to improving the performance of the car in that kind of environment. A great deal has been done."

--Gordon Mills, Vice-President
and General Manager,
Procor Limited before
MacMillan Yard inquiry
April 4, 1984.

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The hearing opened March 19, 1984, and ended July 4, 1984.

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INTRODUCTION

A simple accident. But not quite. The winter storm surrounding the MacMillan Yard explosion gave way to the spring thaw of doubts, questions and astonishing revelations. Who ensures the integrity of the dangerous-goods tank cars on Canadian roads? What did PROCOR really order from the suspected Phoenix Corporation? As-rolled steel or normalized steel? How did a two-foot crack escape detection in the PROCOR plant? Why is there so much discrepancy in the PROCOR evidence? Can we trust the Association of American Railroads to vigorously enforce new demands for steel quality control?

The questions and doubts multiply. When is an EMPTY tank car empty? Who allowed PETROMONT to pump natural gas under pressure into an EMPTY tank car labelled last containing butane? Why is there so much opposition to removing the placard EMPTY from these partially-loaded tank cars? Why are the pleas of the Canadian and U.S. Fire Chiefs ignored? Do the regulatory bodies sufficiently enforce their

authority to ensure reasonable protection for the public?
This inquiry allowed penetration of the issues and opened
the path to astonishing disclosures.

The most intriguing testimony came from William S. Pellini, a renowned steel authority and consultant to the AAR, appearing on behalf of PROCOR. We deal with his comment in the body of this Final Argument but it may be pertinent to this Introduction to recall just a few of his statements.

Steel changes names: "So these things are like chameleons. Everybody uses their own name, slaps on their own kind of paint to identify it and it is the same bloody piece of steel."

Condemning Phoenix Steel Co. practices: "It is when somebody goes wild, like this Phoenix outfit ... Yes, I would get on it (Phoenix) with both feet."

Use of TC-128A steel: "So I went back to the AAR and said, 'How in the devil ... Where did this come from?' Nobody knew. Never heard of it."

Danger of MacMillan Yard tank car: "It wasn't empty... From the point of view of the energy, that passed the chunk (exploded steel head), it had 65 p.s.i., 65 pounds for every square inch ... With 65 p.s.i.g., this particular MacMillan Yard case had twice the rupturing potential and throwing of pieces than if it had been filled with propane on the way out."

Strength of pressured tank cars: "A tank car is a very soft structure really. Compared to the diameter, the shell thickness is rather thin. It is a little like a beer can. You can push it in that easily."

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I. A STRANGE EVENT

Mr. Chairman,

We believe there is general agreement on the basic events of February 28, 1984. It was a stormy night, with snow swirling around the MacMillan yard and piling up around the tracks. Arnold McGrath, the retarder operator, had just come on duty for his night shift and had barely begun his humping operations when he heard a loud bang or explosion which seemed to come from track C-8. From his tower post, his vision that night was at times partially obscured by the snow.

Because of difficulties and limitations in the computer system, humping had been switched from automatic to the manual mode. That placed increased responsibility on the judgment of the operator in controlling the speed of the cars coming down the hump and release from the last retarder before rolling into their designated tracks. Mr. McGrath,

an experienced operator, stated that he did not allow excessive speed in the handling of the cars but he recalled that there have been occasions when the speed of the cars had been high on rolling free from the last retarder. He also stated that once released from the last retarder, there is no way of controlling car speeds.

On the night of February 28, Mr. McGrath had humped a series of cars into track C-8, including three 112 tank cars placarded EMPTY. Shipping documents accompanying these cars which came from Varennes, Quebec, stated these cars last contained butane, a dangerous product. All the early evidence before this inquiry tended to support the documentation which later turned out to be insupportable and misleading.

The thought that may immediately spring to your mind is this: Well, what if someone did backfill these tank cars with natural gas and fail to report this on the shipping documents? What harm is there?

Day in and day out these tank cars placarded EMPTY flow through the City of Toronto at speeds of up to 50 miles per hour. The public has been assured by a panel of the Railway Transport Committee that they are not very dangerous. No regulatory steps have been taken to control those speeds, even in a 13-mile congested population strip where evacuation is considered difficult and perhaps even

impossible. We ask you to consider whether this is a fair and equitable risk.

Dr. Douglas Napier of the University of Toronto, a recognized chemical explosives authority, estimated the explosive force of that failed car and many hundreds of similar loads as equivalent to nine tonnes of TNT. More frightening was the evidence of William S. Pellini, consultant to the Association of American Railroads, who estimated that the contents of that failed car and similar cars had twice the rupturing power of a full load of butane.

Mr. McGrath testified that these and other chemical EMPTIES are treated on the hump as ordinary box cars. There were no special precautions. You can picture the attitude of these operators in handling the EMPTIES. They are just normal cars. It is our contention -- and the contention of emergency response forces -- that these are not normal cars. They are dangerous and can be extremely dangerous. As Mr. James Drew, the CN yard superintendent, observed in showing you his Awareness film, these EMPTIES must command respect.

While there may be general agreement among the parties of Record on the basic events of February 28, there is disagreement or lack of resolution on other issues.

We can assume that the explosion, or the "outward thrust" as the Petromont plant manager would have it,

followed the movement of the heavy 123-ton covered hopper car into track C-8. And that vehicle may have delivered sufficient impact to tear open an existing crack in PROCOR's tank car UTLX 98646. But we have no evidence of the actual coupling speed of the hopper car. In view of the structural vulnerability of UTLX 98646, the overspeed as such may have been very slight, yet sufficient to cause extensive damage.

Documents submitted to this inquiry by CN witnesses indicate that retarder operators aim at a coupling speed of about four or five miles per hour and with some exceptions that target speed is met. It is the exceptions that concern us. Graphs introduced by Mr. Robert Radford, Chief Mechanical Electrical Engineer for CN Rail, indicate that on occasion coupling speeds climb beyond 10 miles per hour.

And if you examine exhibit CN-42 on page 29, which deals with head shield tests on the 112 cars, you will note the comment: "It is not realistic to design for impacts over 10 miles per hour since they are destructive (to even the car), producing coupler forces over 1,645,000 pounds..."

Unfortunately, graphs submitted by Mr. Radford do not indicate the rate of accidents at increased coupling speeds. And Mr. Radford said he did not have such information. We do know that some accidents have occurred in previous years in the MacMillan yard but we do not have the details and we do not know how they relate to high coupling speeds.

And so not knowing the coupling speed that night of February 28, and taking into consideration the evidence by Mr. McGrath that he did not allow high speed, you may conclude that an element of doubt remains on the exact momentum involved.

We take it, of course, that Mr. McGrath did not know that UTLX 98646 and accompanying cars contained natural gas vapour between 55 and 70 psi pressure. Mr. Radford later stated that 70 psi is equivalent to an enormous force. This is confirmed by the evidence of Dr. Napier and Mr. Pellini. To say, as Mr. Jacques Paquette, plant manager of Petromont at Varennes, Quebec, stated in evidence, that natural gas vapour at 70 psi is an inert force can be misleading. To be told that humping yard operators simply treat these chemical EMPTIES as ordinary cars is disturbing. It is our hope that as a result of this inquiry never again shall these mislabelled EMPTIES be treated as ordinary cars -- anywhere.

The MacMillan yard handles a great deal of traffic, of which only a small portion relates to the 112 and 114 tank cars. And yet when the Railway Transport Committee ordered a temporary halt to humping of 112 and 114 cars, there was a tremendous uproar of complaint from CN and CP, and assorted shippers, to the effect that the country would be virtually crippled by delayed rail traffic.

It appears that Canadian humping and switching yards are not designed to entertain any restrictive orders that would interfere with the ordained traffic patterns. You order a temporary halt in a small portion of the traffic and you get clobbered with Telexes and complaints to the politicians. Somehow the message must be delivered to the railways that on occasion restrictions may become necessary and they must learn how to cope.

In the MacMillan yard, the yearning for technological advances including higher humping speeds seems to have ignored the vital computer system. It is clearly antiquated. In the evolution of computer design, 20 years is a very long period and obsolescence arrives rapidly. Despite alleged modifications, we believe the MacMillan yard system contains inadequacies which place greater dependence on the judgments of the retarder operators.

That doesn't mean we place the entire blame for the MacMillan explosion on Mr. McGrath's handling of the humping operations. Far from it. He did his job as he was told, or not told. The state of UTLX 98646 was such that it could have failed almost anywhere. It could have failed with a full load or a partial load. It was ripe for failure. Fortunately, the accident occurred at the fringe of the yard and no one was hurt. We escaped, as we did in Mississauga.

But let us consider what the accident disclosed: bad steel, or fracture-sensitive steel manufactured out of specification; bad welding practices leading to a two-foot crack in the head, painted over; inadequate inspection at the PROCOR plant; inadequate general supervision by the Association of American Railroads; dangerous humping practices in the yard; false labelling of car contents; misleading information for emergency response officials.

To top it off, information on the accident was withheld from the public for three days. Although the CN Awareness film emphasized that the news media are among the first parties to be alerted following an accident of this kind -- and Mr. Drew stated that he gave the accident information to his public relations staff -- for some reason CN decided not to make the occurrence public.

Mr. Justice Samuel Grange stated in his 1980 report on the Mississauga derailment that the Canadian Transport Commission has a duty to answer to the public and we plead with you to address this point in your report.

II. S U S P I C I O N S W I D E N

It soon became evident, Mr. Chairman, that the MacMillan yard explosion was no run-of-the-mill accident. We commend you for the manner in which you proceeded to install a panel of experts to look into the technical side of the occurrence. We suspected and we believe others suspected that there was more in that failed tank car than residues of butane -- of an amount that would classify the tank car as EMPTY.

At the outset, we had no idea that a car with such lethal threats to the public could emerge from a manufacturing plant with a two-foot crack in its structure. Of course, accidents happen. As Mr. Pellini observed, even space shuttles can malfunction. But a tank car is not as complicated as a space ship. It is not much more than a cylinder on wheels, an observation again made by Mr. Pellini. The integrity of the cylinder depends on the quality of its materials, the soundness of design and the application of good workmanship. Yet we have here in this

inquiry a sorry tale of faults that range from production of components to plant inspection systems.

Who allowed Phoenix Corp. in Delaware to produce steel heads for PROCOR in Oakville, Ontario? Who checked the certificates that Phoenix issued with each head? Who checked the heads on arrival at PROCOR? What did PROCOR really order? As-rolled steel or normalized steel? In a statement on June 15, Mr. Gordon Mills, PROCOR vice-president, advised the inquiry that Phoenix had certified the 595 heads which PROCOR had purchased as "normalized". On July 4, when he changed an important portion of his evidence, he disclosed that the 595 heads were as-rolled, which, he stated, was all that was required under the AAR specifications. We shall deal with further evidence by Mr. Mills later in this Final Argument but it would appear that PROCOR was prepared to meet only the minimum requirements of the specifications, rather than the maximum.

And if that is the case, can we expect anything more than the minimum requirements in other aspects of construction inside the PROCOR plant? The AAR specifications did not set minimum standards for grain size in the heads. But it is curious that when Dow Chemical ordered 112 tank cars from PROCOR, it demanded normalized steel. And Mr. Mills stated on July 4 that Phoenix did provide the normalized steel for the Dow Chemical cars. Did Dow Chemical suspect that the AAR standards were inadequate?

It became evident during the course of the inquiry that while the accident in the MacMillan yard resulted from a combination of events that made it a unique and isolated occurrence, the grave deficiencies and faults discovered in the components of those events may give rise to more accidents, with even more dangerous consequences.

This inquiry, as extensive as it turned out to be, did not bring the Phoenix Corp. into the witness box. We do not know how many heads this American company produced out of specification. We do not know how many pressurized tank cars on Canadian roads have been built with coarse-grained heads similar to UTLX 98646. Dr. George Weatherly of the University of Toronto, an experienced metallurgist, has urged testing of all the 595 heads imported by PROCOR from the Phoenix Corp. in the 1978-81 period. Mr. Mills has stated he will not proceed unless so ordered by the Railway Transport Committee.

To support the PROCOR position, PROCOR provided Mr. Pellini as a witness. But Mr. Pellini proved to be quite candid and open. He condemned the Phoenix Corp. as a "wild" outfit. He said he had no way of knowing how much of the Phoenix production was "improper".

We submit there is sufficient evidence before you to conclude that at this stage there is no way of knowing, without further testing, whether fracture-sensitive coarse-

grained steel, produced by Phoenix for PROCOR, is still moving on Canadian roads, increasing the risk of brittle failures when temperatures drop next winter. We urge that Dr. Weatherly's advice to you, to seek further examination of the grain size of the Phoenix steel, be given full consideration.

Either that, or the remaining 594 or 593 heads be pulled off the roads.

Certainly, to allow resumption of indiscriminate humping speeds for the 112 and 114 cars, EMPTY and LOADED, before the integrity of the Phoenix steel can be verified would add an unwarranted high risk to the public, in the yards and in the vicinity of the yards.

And to consider that removal of the existing moderate humping yard restriction on coupling speeds would relegate the chemical EMPTIES to the old role of ordinary box cars raises frightening possibilities. We can only repeat our hope that never again will chemical EMPTIES be treated as ordinary box cars, anywhere.

As the inquiry widened, and the Hearing moved from Toronto to Hull, Quebec, for the purpose of gathering evidence from Petromont, it became increasingly clear that the Canadian regulatory body, the Railway Transport Committee, must exercise greater control to ensure the

integrity of these dangerous-goods cars travelling on Canadian roads. How is this to be done? Has the RTC adequate staff? Will the Treasury Board provide the necessary funds? What good is there to issue regulations and Orders if they are not enforced?

That strikes at the issue of government policy and government determination to protect the public and ensure a safe rail system. Must the RTC therefore keep watching political signals before it acts? Surely not. The mandate and obligations of the RTC are clearly set by Parliament. If governments refuse to provide the necessary funds, then it is the duty of the RTC to report the problem to the public. All governments are the creatures of the public and the public can make its own determination, on the basis of the facts and public needs. That is the purpose of the elected representatives in Parliament.

The duty and obligations of the Canadian Transport Commission to the public have been set out by Mr. Justice Grange in his 1980 report on the Mississauga derailment. We believe the Magee Inquiry, as it may become known, provides the proper occasion for fleshing-in the Grange declarations. Can the regulatory body of Canada exert any real influence on the quality of steel imported or produced for pressurized tank cars? Can the RTC influence manufacturing procedures? Can the RTC influence the AAR?

And what are the penalties if the RTC is not obeyed? What power has the Canadian regulatory body over a trade organization centred in the United States? Is it necessary to establish a Canada-United States commission dealing with cross-border rail traffic in the same way that the two countries have established a joint body on boundary waters? We believe these are not frivolous matters that can be brushed aside. Sooner or later they need to be addressed and we believe the best time is now.

The end result should be that pressurized tank cars emerging from manufacturing plants will bear certificates which mean what they say, including fine-grained steel to ensure against dangerous brittleness and proper inspections from the time the steel is manufactured to the release of the tank car for road operations.

And it follows that documents accompanying loads of dangerous products or partially-loaded cars currently described as EMPTY must truly reflect what is in those tank cars. Shipping documents would not have informed firefighters of the true contents of the MacMillan yard car that failed. Firefighters would not have known that it contained methane under pressure. If the onus is on those who impose the risk, the responsibility for what transpires must rest with them.

In the early stages of the inquiry, one RTC witness stated that if the tank car had contained natural gas vapour under pressure, then the transport was illegal. But was it? Counsel for Mr. Paquette of the Petromont plant argued that no law was breached. In Canada there appears to have been a memorandum or note issued by the RTC stating that tank cars placarded EMPTY must not contain more than two per cent of the original load. In the United States official regulations allow the EMPTY placard to be displayed on tank cars containing up to three per cent of the original load by weight or one-third of the volume of the last bill of lading. American tank cars move on Canadian roads.

Now, U.S. authorities are giving consideration to a requirement that "empty" tank cars be placarded in the same manner as that required for loaded tank cars. Needless to say, there is resistance by the shippers and carriers. In Europe there is no permission for such a placard as EMPTY. The tank cars carrying these lethal and toxic chemicals are considered dangerous, whether fully loaded or containing residue. Here in Canada we've had trouble with the so-called EMPTIES. On impact one of them exploded in a very dramatic fashion in Winnipeg. We still don't know the true amount of residue in that car at the time of the explosion.

We abhor the use of the word EMPTY as being misleading and dangerous. We ask that the word be abolished from the vocabulary of dangerous goods placarding.

We also ask that pressurized tank cars be better identified. We ask that they be painted orange for clear visual identity in the event that the placard is destroyed during a derailment or explosion and fire.

These tank cars have to be repainted every three or four years in any case. What is the cost of changing the colour from black to orange? And what an advantage it would be for emergency response forces to see something that would give them a clue as to the contents, especially when the derailed cars are buried or half-buried down a gulley and only a few parts of the tanks are visible from the embankment.

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III. S T E E L C H A L L E N G E

All the experts agree that the quality of the steel in the failed MacMillan yard tank car was deficient. Whether this deficiency was known to PROCOR at the time of manufacture is another matter. There are discrepancies in the evidence as to what PROCOR had ordered from Phoenix. But we do agree with the experts that the specific accident in the MacMillan yard had three converging elements: brittle steel -- or fracture-sensitive steel operating in cold temperatures -- a pre-existing crack and an impact load.

To the extent that no accident of a similar nature has been previously reported, you may conclude that this was a unique case and the probability of the three converging factors occurring at the same time at some future date is remote; at least it is of low probability. But we submit that the matter cannot be dismissed in this manner. The accident has thrown up glaring deficiencies which threaten

public safety and which increase the possibilities of complete disintegration of pressurized tank cars under severe winter conditions.

You might conclude that the MacMillan yard accident might not have occurred if the tank car had not been back-filled with natural gas vapour under 65 p.s.i. pressure. It might not have occurred if sound steel had been produced by Phoenix.

And it might not have occurred if it had not been given a good nudge by a heavier car probably travelling at more than four or five miles per hour.

These are all possibilities and you may wish to give weight to each in judging how they might interact to produce a public threat, particularly in the dead of winter when these cars, classified as EMPTY or LOADED, pass through densely-populated areas where there may be no means of escape.

You have already dealt with the problem of coupling speeds, with the RTC imposing a moderate speed limitation affecting 112 and 114 cars. And you have indicated that you intend to look into the matter of the EMPTY classification and how it relates to the transport of natural gas vapour under pressure.

The more complicated matter is the quality of steel and the control of the manufacturing process that turns this steel into tank cars qualified to carry heavy loads of lethal and explosive chemicals over Canadian roads.

Both Mr. Pellini and Dr. Weatherly have provided you with excellent guidance. Both have expressed concern over the quality of the steel that came out of the Phoenix mill in the form of the 595 heads. It is true that Phoenix did not have the opportunity to defend itself. Mr. Pellini described this company as having gone "wild", presumably on the basis that it produced steel out of specification, coarse-grained steel that increases the risk of brittle fracture as winter temperatures drop. We do not know how many of the 595 heads were out of specification.

PROCOR counsel attempted to persuade Mr. Pellini to agree that tests already undertaken by PROCOR were sufficient to ensure confidence that the remaining heads are sound. But Mr. Pellini would not agree. "The essence of your question," replied Mr. Pellini, "really involves estimating what part of the Phoenix production was improper and I have no basis for doing that."

This lack of confidence on what Phoenix produced led Dr. Weatherly to suggest some form of inspection -- either ultrasonic or in situ metallography -- on all of the remaining heads, not just the welds but the quality of the steel.

Mr. Mills of PROCOR indicated that he would not proceed with the further inspection unless he is ordered to do so by the RTC.

Now, in defence of Phoenix you might say: what did PROCOR order? In a statement under evidence on June 15, Mr. Mills insisted that the manufacturer had certified the steel as "normalized" (page 2771 of the transcript) but when we discovered discrepancies in his evidence and when he was recalled on July 4, he described this particular import as "as-rolled" steel. Further, he stated there is no requirement of the specification of a 112 car "that the steel shall be normalized."

It is important to note that on July 4, under cross-examination, Mr. Mills disclosed that another batch of steel heads had been imported from Phoenix about the same time as the 595 heads but this second batch had been normalized at the request of Dow Chemical for whom PROCOR manufactured 112 tank cars.

We shall deal with the question of the credibility of the PROCOR evidence in a separate section but we believe there is sufficient material before you to conclude there is remaining doubt surrounding the soundness of the heads -- the entire batch of 595 heads which PROCOR obtained from Phoenix during the 1978-81 period. And we believe that some further examination should be undertaken, harking back to

Mr. Justice Grange that the burden of proof should fall on him who creates the risk.

And while you consider the responsibilities of PROCOR, you may also want to examine the responsibilities of the Association of American Railroads and the confidence you may have in the AAR in the light of Mr. Pellini's evidence. In its position of dominance over the railway systems in the United States and Canada, the AAR is not a government but it has obtained many of the powers of government. It sets specifications for tank car production and receives certificates of compliance in virtually every aspect of manufacturing, from the steel itself to the tank car that emerges for road operations.

It is clear from the evidence before you that the AAR did not do much of a job on policing of steel production. And if you look over the history of the 112 car, you may wonder about the quality of AAR supervision in allowing a tank car on the road with such structural weaknesses that large numbers had to be recalled in the early 1970s for saddle-area reinforcement following a series of accidents.

Is the AAR any different now than it was in the early 1970s? You will recall that Dr. Harris, the vice-president, appeared before you in the 1981 Show Cause Hearing and exclaimed that because of tank car improvements, the days of violent ruptures were over. What an amazing statement that

was, and how it gladdened our hearts. Except it wasn't true. The days of violent ruptures were not over. And we've had a series of violent ruptures since then, including a world record 3,500-foot rocketing in Murdock, Ill., last October.

Mr. Pellini gave you a clear picture of how the AAR handled the question of quality -- it received certificates from the manufacturer and the certificates were filed away -- until the AAR was confronted with a major problem. Mr. Pellini stated that he has been trying to make some impact on the AAR. But since he was hired as a consultant in 1974, he hasn't had much success. Now he believes he is going to get more attention.

But you will also note, as Mr. Pellini proceeded under cross-examination, that he had some deep doubts about North American steel production. The kind of steel required for Canada's deep-freeze winters is already available, he said, but not in North America. Japan has moved into the forefront. And when finally, after five or 10 years of studying this steel for North American use under the auspices of the AAR, the steel will still have to be imported from Japan. So predicts Mr. Pellini.

Dr. Weatherly stated that it is technically possible for this low-temperature steel to be produced in Canada. But you may consider there is always a gap between technical

ability and on-site construction. There must be incentive, and drive, and determination.

In the meantime, we have to consider how best to cope with the steel available. Mr. Pellini produced a chart which indicated that over a 16-year period, the number of brittle fractures involving lading loss were relatively small when compared to total North American accidents. While the figures he produced were sharply questioned, the general point he made seems valid: a brittle failure is in the category of low probability, high consequences. Total disintegration of a propane tank car in a heavy population area is hopefully a small risk but the thought that it might happen and could happen is sufficiently awesome to warrant measures which may help prevent it.

Let us consider one other point: any chart which attempts to show a relationship between North American accidents and cold weather must through sheer reality weigh heavily on the side of Canada. If there is going to be a brittle failure, chances are it is more likely to happen in Canada than the United States. And we've had our brittle fractures and our brittle failures. The technical jargon may be important to the technicians but for the victims it may be of little importance whether you call it a fracture or a failure. It is a huge and violent explosion carrying with it the prospects of catastrophe.

In judging AAR laxity, you may recall Mr. Pellini's remarks on how TC-128A steel got into use and what he discovered when he went back to the AAR after the Austin, Man., explosion and tried to find out where this steel had originated. "Nobody knew", he testified. "Never heard of it."

Fortunately, TC-128B steel is considered of better quality, when it is not coarse-grained. But it still leaves Canada vulnerable when temperatures drop to -20F or lower. You might wish to consider whether humping of 112 and 114 cars under such conditions should be handled with greater caution. You have the evidence before you that because of temperatures we experience, tank cars in Canada are often in a brittle mode.

In relation to their size, 112 cars have relatively thin skins. Mr. Pellini stated that all steel is ductile and this ductility or stretching effect gives the tank cars some resilience when hit by another car. But of course the load inside the tank tends to exert pressure against the inside surface of the skin, reducing the resilience. And as temperatures drop, that ductility is reduced and brittleness takes over.

It is quite clear from the evidence that coarse grain increases the threat of brittleness in cold temperatures and increases the threat that a microcrack will be initiated more quickly after impact.

We should clear up at once any remaining confusion over Mr. Pellini's statement that a crack-like defect must be in the steel before brittle fracture can result. Initially, it appeared that Mr. Pellini was referring to a defect prior to impact but from cross-examination it emerged that the defect can take place a split second before disintegration. The manner in which this microcrack propagates has been adequately explained by Dr. Weatherly. We can take it that the technicians are merely stating this: after the tank car is hit, the first thing that happens is that the steel cracks and this leads to a split, allowing a mixture of air and contents, with a spark doing the rest.

And so you come down to the evidence of Mr. Radford of CN who stated that brittle steel is not by itself of any significance in consideration of public safety. You may well ask what does Mr. Radford mean by "significance." It would be logical to agree with him that as long as nothing interferes with that tank car in its brittle state, it may perform reasonably well. But can we guarantee that nothing will interfere with it?

High impact on a cold winter day is a risk. Coarse-grained steel is an added risk. The existing order limiting coupling speeds on 112 and 114 cars to four miles per hour is considered a reasonable operating level and is indeed of the kind within the general aim of the railways. Mr. Radford suggested couplings could go up to nine miles per

hour on a few occasions and CN could still live with that, keeping it clear "of a significant level of damage to equipment and it is well clear of the level at which damage will be caused to 112 and 114 tank cars to the extent of losing lading, well clear."

On page 29 of CN-42, you have this comment on tests dealing with head shields of 112 cars: "It is not realistic to design for impacts over 10 miles per hour since they are destructive (to even the car), producing coupler forces over 1,645,000 pounds ..."

With due respect, Mr. Radford addressed his argument for returning to the old free system of humping yard coupling speeds to the forces a "sound" car will bear.

In our view it is not what a sound car will sustain but what a tank car with coarse-grained steel out of specification, brittle steel, will sustain. Mr. Radford did not address that point. And while he produced a number of graphs showing the majority of couplings were within the four and five-mile range, he could not produce documents showing the relationship between high coupling speeds and yard accidents.

To boil Mr. Radford's dissertations down to their essentials, we ought to conclude that -- in his view -- the MacMillan yard explosion was simply an isolated case and it

is quite all right to go back to the old system where chemical EMPTIES were treated as ordinary box cars and there will be no "significant" risk.

Well, after all, an EMPTY chemical tank car doesn't have much lading in it and perhaps in company terms the customer won't suffer much if the tank does blow up.

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IV. A FLAWED WORD

It is clear from the evidence before this inquiry that the tank car which exploded in the MacMillan yard and which was placarded EMPTY was not empty -- no matter how you can possibly define the word empty. And it is our hope, as a result of this inquiry, that never again shall chemical EMPTIES last containing dangerous products be handled as ordinary box cars, anywhere.

We believe, and the firefighters of this country strongly support our views, that the use of the word EMPTY in application to chemical rail traffic is unfortunate and misleading. It originated as a tariff designation. In the days when the chemical industry was in its infancy, the use of the word was not much of a problem. But as we moved deeper into the chemical age, the word EMPTY as a placard on toxic and explosive rail cargoes caused confusion and complications for emergency response forces.

It may be an argument by the railways that their employees all know the meaning of the word and it may be worth considering the assurances by Mr. James Drew, superintendent of the CN MacMillan yard, that in his visits to various municipalities, the people he addressed seemed to have some clear understanding about the EMPTIES. Mr. Drew commended the emergency response forces for treating these EMPTIES with respect -- indeed, with the same respect as LOADED cars.

And yet Mr. Drew would want you to remove the moderate RTC Order on coupling speeds to the extent that employees in the MacMillan yard would resume treating these EMPTIES as ordinary box cars. Thus you will see a double standard: to recognize these cars as dangerous when they get into trouble but not to give them the same respect before the trouble begins.

It is curious how two persons viewing the same event can respond in different ways. Mr. Drew would lead you to believe there is widespread recognition that the word EMPTY means there is a fixed and limited residue of dangerous product in the tank. And yet when we questioned some of his employees at the time of our visit to his yard, two of them responded by saying they know little about the contents of the tank cars other than the cars are getting bigger. That is what had impressed them. Over the years the tank cars had grown in size.

And so we suggest you give some credence to the argument of the union witness, Mr. Miloff, when he maintained that the clerical staff get little training on the meaning of the dangerous chemicals handled in the yard. You will recall that CN countered with evidence that it conducted an extensive dangerous-goods training course which, on cross-examination, turned out to be no more than a 60-minute briefing session.

It may also be pertinent to recall the evidence of Mr. Wilmar Karaskewich, RTC Chief Compliance Officer, following his visit to the CN yard at Riviere-des-Prairie, Quebec, where he found yard crews who were unable even to identify 112 and 114 cars. You may wonder how much training the yard employees really get on the details of dangerous-goods cars and their contents.

As for the general public, it may be worth mentioning that when the Chairman of this inquiry voiced a view that to him EMPTY did not mean empty and he was convinced there was something in the tank car that failed, the local newspapers interpreted this as a new disclosure. The general public is confused by the word and the evidence before you is that many firefighters, especially voluntary firefighters in small communities, are also confused.

You have the evidence of Fire Chief Gordon Bentley of Mississauga, a director at large of the International Association of Fire Chiefs, reflecting the views of fire chiefs on both sides of the border. You have the evidence of the Canadian Association of Fire Chiefs. They consider the use of the word EMPTY on the placard of the tank cars carrying residues of very dangerous chemicals as misleading and dangerous. They have pleaded for change. U.S. authorities are moving toward a decision to placard EMPTY tank cars in the same manner as that required for LOADED cars. Unfortunately, in Canada, there is still resistance to change, as you have seen from the evidence of Dr. Helen Morton of Transport Canada.

Of course the argument can be made that it is up to the fire chiefs to train their men to recognize the dangers of the various tank cars marked EMPTY but should the responsibility end there? Who created the risk in the first place?

Now, with new regulations about to be issued in Canada concerning dangerous goods, there may be an opportunity to resolve this matter once and for all. During the course of this inquiry we proposed the word PARTIAL (PARTIEL) in place of EMPTY. The enthusiasm of the

scientific adviser to the RTC stirred us to bring our proposal to the attention of Transport Canada but through the appearance of Dr. Morton we discovered new roadblocks.

Transport Canada believes the word chosen must have five letters or less. Or the word may appear in smaller letters on the placard. You may ask: what is the difference between five letters and seven letters if the result benefits the emergency response people? PARTIAL may not be the best word in the world but we maintain it is much more applicable than the misleading word EMPTY.

There is more to this problem than the misleading word on the placard. Documents accompanying the tank car must tell firefighters what that car really contains. To describe the contents as last containing butane when in fact there is natural gas vapour under 65 p.s.i. pressure is not helpful to the emergency response forces, to say the least. You will recall the testimony of Mr. Radford that the 65 p.s.i. was an enormous force. And you will recall the comment by Mr. Pellini that the rupturing power inside that failed car was twice that of a full load of butane.

We plead with you to consider the case set out by Fire Chief Bentley. He speaks from a position of experience and duty. When he states that many small fire departments do not get the kind of training to accumulate knowledge on how to handle these so-called EMPTY tank cars, we should accept his evidence as a matter of substance.

Why would the fire chiefs criticize a placard if they did not find difficulty with it? What advantage would there be for this criticism if the fire chiefs did not feel these placards did interfere with their performance?

The efforts by Mr. Drew to discredit the evidence of Fire Chief Bentley must be viewed as the efforts of a representative of a vested interest group. And, indeed, if the fire chiefs call for a change in the placard, why should not the railways support such a call? Why should they oppose it? What is the advantage to the railways in resisting the plea of the firefighters? These questions must be weighed for the benefit of public safety.

Mr. Drew is to be commended for visiting various municipalities to try to impress on them the problems associated with dangerous chemical loads but it must be emphasized that there is a heavy turnover of personnel among rural fire departments and a single lecture once every three years may not be sufficient to leave any lasting impressions.

V. NEW DOCTRINE NEEDED

A central question which arises from this inquiry is whether the Canadian Transport Commission and, through it, the Railway Transport Committee exercise sufficient control over the design, manufacture and operation of pressurized tank cars operating over Canadian track.

In his 1980 report Mr. Justice Grange voiced criticism over the fact that much of this control rests in American hands. The car which failed, and cars similar to it, were designed in the United States, under the direction and supervision of the rail trade organization, the Association of American Railroads. Note it is not Canadian-American, simply American.

This reference is not intended to be unduly critical of the AAR or its Tank Car Committee. Nevertheless, we are a sovereign country with technical abilities and technical goals of our own and it is questionable whether we need to depend entirely on the American rail technicians to tell us what kind of pressurized tank cars should run on our tracks.

Nor can we depend entirely on American assurances that steps taken by the AAR are fully in accord with Canadian needs. We had the word of the AAR vice-president three years ago that the days of violent ruptures were over and violent ruptures have occurred in many places since then, including Canada. Train loads are getting heavier; train lengths are increasing. The volume of chemical traffic is increasing. We have moved into an age where we are becoming more dependent on substitutes, chemical substitutes. The volume of dangerous chemicals on the market is increasing and the variety is constantly widening.

At the same time it has been indicated in evidence by Mr. Mills of PROCOR that economic considerations exert major influence on the kind of vehicles produced to haul these dangerous goods. Some evidence has been placed before you showing there has been a history of difficulties associated with the 112 car and these difficulties have centred on the very structural area where UTLX 98646 failed.

We merely use this point to illustrate that over the years what the AAR may approve for road use may have been done with some sloppiness or undue emphasis on economic benefits over public safety.

It is quite easy to say that the car UTLX 98646 failure was a unique case -- a combination of bad steel, bad

welding practice and faulty handling of coupling speeds. But was the design of this tank car the best design for safety purposes?

Mr. Mills stated in evidence that if you take only safety into consideration, you will end up with such thick steel that the car becomes economically useless. We agree. But there is always the temptation, in the employment of cost-effectiveness, to look at design as a way of achieving maximum capacity at the lowest cost. The 112 car may be seen as a stripped down version of earlier pressurized tank cars; stripped down to stay within a maximum weight limitation and yet achieve maximum capacity. It is, as Mr. Pellini stated, not much more than a cylinder on wheels.

Looking ahead, we can see that chemical traffic is likely to take an increasing slice of over-all rail traffic. Has the CTC given enough attention to this prospect? If we are to continue to lean on the AAR to ensure the production of safe tank cars -- keeping the extremely low Canadian winter temperatures in mind -- must we be resigned to relating our needs and our goals to those of the American rail industry? Must we constantly look southward for direction of our requirements? Surely, it is time for an assessment of our Canadian technical abilities and our needs.

If we cannot come to grips with our specific tank car requirements, and establish our own production sources, then, and only then should we admit our failures and our shortcomings and accept the benefit of our betters.

It has been admitted during this investigation that in effect the CTC has delegated its powers on design and production of 112 tank cars to the AAR. It is true that the Red Book speaks of CTC approval but in fact the CTC doesn't exercise much influence over the AAR and its Tank Car Committee. Now we have recommendations by the inquiry's technical group calling for greater scrutiny of the steel for tank cars and the production of the tank cars.

We support the technical group's recommendations and urge you to place them before the RTC to seek acceptance and implementation with the greatest speed. We are not sure how the AAR would interpret these recommendations and we are concerned with the interpretations offered by Mr. Pellini, suggesting a greater laxity than Dr. Weatherly had anticipated.

We realize the RTC must approach the AAR since a government-to-government agreement may take years to negotiate and time is not on our side. Under the situation which exists we will have to consider the possibility that more accidents lie ahead, perhaps even of the kind that made Mississauga a focus of international attention.

We may have wandered a bit in this portion of our argument but we cannot overlook the responsibilities of the RTC under the law and the pressures that can be exerted against the RTC. We have seen it here in this inquiry in the chorus that developed when the rail industry and shippers and associated industries fell into line to riddle the RTC with the cannon fire of Telexes and other missiles aimed at early removal of an RTC Order halting the humping of 112 and 114 tank cars. It was a raw, shocking display of economic power that did not make the job of the RTC or the presiding Commissioner any easier.

Nor was the public's job made any easier by the threats of contempt that fell upon its representative under allegations which we maintain did not coincide with the facts. It is no enviable job to seek reasonable protection for the public in circumstances where plainly the forces of resistance are deeply entrenched.

In reference to the AAR, it may be pertinent at this point to conclude with an observation by Mr. Justice Grange in his 1980 report where he stated:

"I have no doubt that the Canadian railways and the Canadian tank and car manufacturing companies and shippers contribute to the AAR deliberations, but it is not in my opinion

enough to rely on private and American efforts. We are concerned with the transportation of dangerous goods in Canada. We must take advantage of all knowledge to be obtained from any source but we must also attack the problems from the viewpoint of the Canadian public and I am sure there is in Canada knowledge and talent available to help."

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VI. PROCOR'S EVIDENCE

Undoubtedly, there are times in the gathering of evidence where a witness may err in recounting events and his error is forgiven, even when he is under oath. But where a witness prepares a statement in consultation with his advisers and presents this statement in evidence, the possibility of error in fact should be less likely to occur -- compared with recalling events under cross-examination.

It is our painful duty to refer you to the evidence of Mr. Gordon Mills, vice-president of PROCOR, in his appearance before you on June 15, 1984, and again on July 4, 1984, when he was recalled to explain discrepancies in the statements he had made and recorded in the transcript.

At the outset it was clear that the evidence of PROCOR was central to this investigation. What we learned about the origin of the suspected heads came from PROCOR; Phoenix Corp. was not called as a witness. The welding flaws occurred in the PROCOR plant. Inspection of certain welding areas in a portion of the other cars built with the

595 heads obtained from Phoenix took place in the PROCOR plant. And there was a scattered hardness test as well.

For much of the information on the results of these various examinations we had to depend on the reports delivered by Mr. Mills. And we accepted his statements as factual. That is, until we delved into the transcript on one occasion and discovered conflict in his statements. And on his return to the witness stand we found more conflict and discrepancies.

For example, on June 15 Mr. Mills read a statement into the record and in referring to the steel heads imported from Phoenix, used these words: "... and that although certified by the manufacturer to be normalized..." (page 2771, line 7 of the transcript). On July 4, under cross-examination, Mr. Mills stated that the 595 heads were "as-rolled steel." (page 3269, line 11 of the transcript). PROCOR had brought in normalized steel heads from Phoenix but that was for a specific Dow Chemical order and was not part of the 595 orders.

On June 15 Mr. Mills made a statement concerning the number of Phoenix heads existing in North America: "I believe my evidence indicates," he said, "that to the best of our knowledge the 595 heads of this type that were supplied to PROCOR are in fact the only heads extant in North America."

Now you may say that he qualified his statement by using the words "of this type" which would indicate a specific type of steel and although he did not elaborate on what he meant by "of this type" it should be recalled that he used the word "normalized" in his statement earlier that day.

We took it, of course, that Mr. Mills was stating that the 595 heads were the only ones from Phoenix existing in all North America. And Mr. Mills did not seek to remove that impression.

He was asked on June 15:

"Q. You mean Phoenix did not supply heads to any other manufacturer except PROCOR?

A. To the best of our knowledge.

Q. To the best of your knowledge. And what period of time are you talking about now, Mr. Mills?

A. This was late '81, early '82. It was a period of very high building in the industry.

Q. Is it to your knowledge, Mr. Mills, that Phoenix did not manufacture heads prior to that time for any company?

A. That is also to the best of my knowledge."

On July 4, after we had advised you that Mr. Mills' evidence could not be correct since the tank car that failed, UTLX 98646, was built in 1980, Mr. Mills stated in the witness box that he wished to change his statement made on June 15. The 595 heads were imported from Phoenix during 1978-81. No heads were imported from Phoenix in 1982.

He also disclosed under cross-examination on July 4 that in addition to the 595 heads previously reported as imported from Phoenix, PROCOR obtained a large number of heads, totalling in the neighborhood of the 595 but no exact numbers were given, also from Phoenix, roughly in the same time frame.

This was the first time we had learned that PROCOR had obtained more heads from Phoenix than the 595 previously stated. Mr. Mills then hastened to assure you not to be alarmed, because, in effect, the steel for Dow Chemical tank cars was of a higher standard.

"Let me assure you," he said, "that that steel (for the Dow Chemical order) is of no concern to us, because it was normalized after the heads had been made, and if there were any problems that had occurred during the head manufacturing process, they would have been eliminated as part of the normalizing process."

And why would PROCOR not use normalized steel for its own fleet of 112 cars? "Because there is no requirement of the specification of a 112 car that the steel shall be normalized," Mr. Mills explained.

And later: "These specifications are clearly set out and the 112 specification does not require normalized steel. It permits use of TC-128 in an as-rolled condition and indeed that is what it is made of. So, for a car that we would build and own in our fleet, we would build to that specification. Which is indeed what we did."

We submit that the situation would be less offensive if Mr. Mills had volunteered all this information at the outset on June 15. He left the impression on June 15 that he had accounted for all the steel heads obtained from Phoenix and that the import period was for a relative brief period in the heavy building period of late 1981, early 1982. We also presume that if he had erred on June 15 by accident, his counsel would have so informed you soon after perusing the transcript for June 15. This was not done.

Cross-examination is for the purpose of seeking elaboration and clarification of statements made and for testing the integrity of the witness and the veracity of his declarations. If a witness errs in one portion of his testimony, it does not follow that all of his testimony is

thereby discredited. But errors or discrepancies do raise doubts. Statements that conflict with previous statements raise more doubts. In the end you may have to consider what weight to assign to Mr. Mills' evidence. That is our contention. We make no charges against Mr. Mills. We make no charges against PROCOR. We simply lay this material before you for your consideration.

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VII. S U M M A R Y

- Never again shall chemical EMPTIES last containing dangerous goods be handled as ordinary box cars, anywhere.
- The RTC Order limiting the coupling speed of 112 and 114 cars, both EMPTY and LOADED, to 4 miles per hour is a safety measure which should remain in effect until doubts about the grain size of the 595 imported heads are removed.
- All as-rolled steel imported by PROCOR from the Phoenix Corp. in Delaware should undergo ultrasonic or in situ metallographic examination for coarse grain. Warnings should be posted on all tank cars containng steel out of specification. Alternatively, these cars should be taken off the roads.

- Recommendations of the Technical Committee under Mr. Stanley Kaplan should be adopted and vigorously pursued to see that they are fully implemented and not watered down by the Association of American Railroads Tank Car Committee.
- The RTC should undertake increased supervision over the manner in which tank cars are designed and manufactured and allowed to operate in Canada. Delegation of powers to the AAR by the CTC should be reviewed, looking toward establishing a Canadian tank car policy.
- Use of the placard EMPTY on tank cars last containing dangerous goods should be ended and replaced by a more applicable term such as PARTIAL. The definition of a PARTIAL load should be made part of the law with penalties for misuse.
- Pressurized tank cars designed to carry dangerous goods should be painted orange for easy identification. The colour should be introduced gradually to coincide with repainting plans.
- New representations should be made to the Federal Treasury Board to provide funds for needed RTC technical staff. Refusal by the Treasury Board to provide such funds should be made public.

- Steps should be taken to ensure that the public is given full information immediately whenever a tank car designated to carry dangerous goods fails.
- Railways operating in Canada should be required to design their yards in such manner that they can continue to function with reasonable efficiency during periods of RTC restrictive orders.

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